APPENDIX A
FIELD PROCEDURES

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This appendix describes the field procedures including: soil vapor well installation, soil vapor sampling, drilling and monitor well installation, groundwater and surface water sampling, soil sampling and analytical procedures, quality assurance/quality control samples; and analytical methods for samples collected during the period from January through June 2006 at the Poway Landfill.

A1. Installation and Sampling of PVP-1, -2A/2B, and -3A/3B

On 30 January 2006, GeoSyntec contracted Vironex of Santa Ana, California to construct three sets of nested soil vapor wells along the south property boundary of the site using a Geoprobe 6600 truck mounted direct push rig. The target depths for the soil vapor wells were approximately 5 and 10 feet below the estimated slab elevations of the adjoining residences south of the site. In advancing the boring for PVP-1, refusal was encountered prior to the target depth of the shallow probe (5 feet below estimated slab elevation for adjoining residence) in 4 locations. After refusal, each subsequent reattempt was located approximately 20 feet east until the target depth for the shallow well was achieved. A single soil vapor well was installed in the current location of PVP-1 at a depth of 18 ft. bgs, which corresponds with a depth of approximately 5 ft. below the estimate slab elevation of the adjoining residence. Nested Soil vapor wells PVP-2A/2B and -3A/3B consist of vapor wells installed at depths of approximately 5 and 10 feet below the estimated slab elevations of the adjoining residences. Soil vapor wells PVP-1 through -3 were constructed using a porous synthetic tip attached to ¼ inch outer diameter (OD) high density polyethylene (HDPE) tubing in accordance with County of San Diego Department of Environmental Health (DEH) small diameter well guidance. The soil vapor wells were constructed as detailed in the well construction logs provided in Appendix C.

On 2 February 2006 GeoSyntec personnel sampled onsite soil vapor wells PVP-1, -2A/2B and -3A/3B. Prior to sampling, the soil vapor wells were purged of approximately three borehole volumes by pumping at a rate of approximately 200 ml/min. Following purging, laboratory supplied and cleaned flow controllers (set at 167 ml/min) and summa canisters were connected to the soil vapor wells for sample collection. During the 2 February 2006 sampling event, isopropyl alcohol was used as a tracer gas. One duplicate sample, one ambient air sample and one trip blank sample were submitted along with the samples to Air Toxics Limited (Air Toxics) in Folsom, California for analysis for VOCs by EPA Compendium Method TO-15 and Fixed Gases by ASTM D-1945.

Laboratory analytical results for the 2 February 2006 soil vapor samples indicated tracer gas breakthrough on 2 of the five primary samples as well as the duplicate sample. Therefore, soil vapor wells PVP-1, -2A/2B and -3A/3B were resampled using the same techniques on 14 February 2006. During the 14 February 2006 sampling event, soil vapor samples could not be collected from soil vapor wells PVP-1 and PVP-2B. The inability to collect soil vapor samples from these soil vapor wells is attributed to high vacuum conditions, possibly the result of soil moisture.

To further assess the vacuum conditions encountered in soil vapor wells PVP-1 and PVP-2B, micromanometers were attached. The soil vapor wells were then evacuated to create a measurable vacuum, and the time for the soil vapor wells to recover to ambient pressure was documented. Soil vapor well PVP-2B recovered to near ambient pressure in approximately 2 hours, whereas PVP-1 held a measurable vacuum for over four days.

A2. Installation of PVP-1A and PVP-4 through -10

On 20 March 2006 GeoSyntec contracted Cascade Drilling, Inc. (Cascade) of Norwalk, California to install additional onsite soil vapor wells using a Geoprobe 6600 truck mounted direct push rig. The additional onsite soil vapor wells were constructed using 6 inch stainless steel wire mesh screens attached to ¼ inch OD HDPE tubing in accordance with DEH small diameter well guidance.

PVP-1A was installed adjacent to PVP-1 in an attempt to determine if the high vacuum conditions observed in the 14 February 2006 event could be attributable to soil moisture. In advancing the boring for PVP-1A, soil samples were retained for analysis of soil moisture content and VOCs by EPA Method 8260B. Moist soil was encountered at approximately 9.5 to 18 feet bgs in the boring for PVP-1A. Therefore, PVP-1A was constructed above 9.5 feet to facilitate collection of soil vapor samples from the southwest portion of the site. Two soil vapor wells (PVP-4A/4B) were installed approximately 1.5 feet apart in separate boreholes between PVP-2A/2B and PVP-3A/3B at depths of approximately 8 and 13 feet bgs (approximately 5 and 10 feet below the estimated slab elevations, respectively, for the adjoining residence). Background soil vapor wells were installed at 5 feet bgs in the northwest corner of the site (PVP-6) and the other northeast of the desiltation basin along the eastern property boundary (PVP-5).

To evaluate the performance of the landfill gas extraction system in controlling landfill gas (LFG) migration, six soil vapor wells were installed in the toe of the landfill. Direct push borings were advanced through the trash into native materials. Soil vapor wells were installed in the approximate middle of the waste and in the underlying native material if a minimum of three feet of dry native material was encountered underlying the waste prior to refusal (PVP-7A/7B and PVP-10A/10B). In borings where a minimum of three feet of dry native material was not encountered prior to refusal (PVP-8 and -9), the borings were backfilled to the approximate middle of the waste with hydrated bentonite granules, and the soil vapor wells were constructed.

The soil vapor wells installed in the toe of the landfill were sampled on 6 April 2006. Soil vapor wells were purged of three borehole volumes prior to collecting samples. Samples were then collected using laboratory supplied flow controllers and summa canisters. 1,1-DFA was used as the tracer gas for the 6 April 2006 sampling event. Soil vapor samples, an ambient air blank, and a trip blank were submitted to Air Toxics for analysis for VOCs by EPA Compendium Method TO-15 and Fixed Gases by ASTM D-1945.

A3. Installation of Offsite Soil Vapor Wells

An encroachment permit was obtained from the City of Poway Planning Department for the purpose of drilling and installing soil vapor wells and collecting soil vapor samples within the public right-of-ways south of the site on Sunset View Road, Dehia, Mirando, and Silla Streets, Los Olivos, El Mar and Acton Avenues. Underground Service Alert was notified 48 hours prior to drilling to clear the boring locations of underground utilities. In addition, GeoSyntec subcontracted Subsurface Surveys, Inc. to perform a geophysical survey in the areas to be investigated at the site to ascertain the location of utilities and other potential subsurface obstructions (Appendix B).

During the period from 11 to 28 April 2006 GeoSyntec contracted Vironex to install 22 offsite soil vapor wells in the residential area south of the site. Eight pairs of soil vapor wells (VW-1A/1B, -2A/2B, -3A/3B, -4A/4B, -5A/5B, -6A/6B, -7A/7B, and -8A/8B) were installed at five and ten feet bgs within Dehia and Los Olivos Streets and El Mar Avenue. In addition, six single soil vapor wells (VW-9, -10, -11, -12, -13, and -14) were installed at five feet bgs in the residential area south of the site to assess background concentrations of COCs. The soil vapor wells were installed using both Geoprobe 5410 and 6600 direct push rigs. For soil vapor wells installed with the Geoprobe 5410, a seven inch bucket hand auger was used to excavate to three feet bgs prior to using direct push methods. Soil vapor wells installed using the Geoprobe 6600 direct push rig were first drilled to three feet bgs using an eight inch hollow stem auger (HSA). Following excavation to three feet bgs direct push methods with two inch core samplers were utilized to collect soil samples for lithologic logging and laboratory analysis to the target depths of five and ten feet bgs. Soil from each boring was logged continuously from the ground surface to the proposed depth of investigation in accordance with ASTM D 2488. Offsite soil vapor wells were constructed using six inch stainless steel wire mesh screens attached to fluoroethylenepropylene (FEP) tubing.

A4. April 2006 Sampling

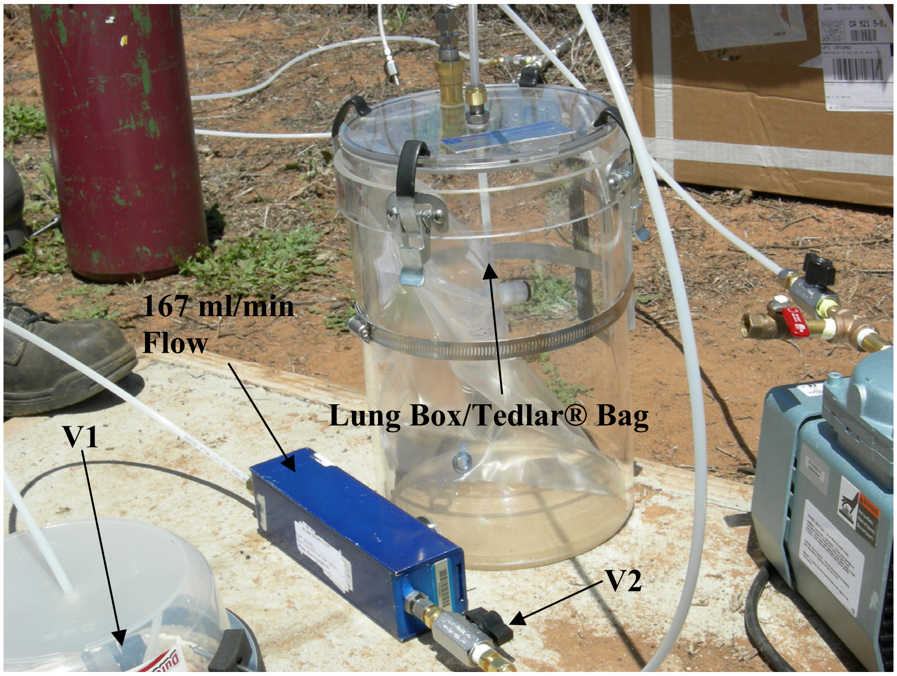
Between 19 and 25 April 2006 the onsite and offsite soil vapor wells were sampled with the exception of vapor wells PVP-7 through -10. Due to the detection of tracer gas breakthrough in 7 of the 14 soil vapor samples collected during the February 2006 sampling events, the soil vapor sampling methods were modified to evaluate vacuum during purging and sampling and to allow for tracer gas breakthrough screening in the field.

Prior to sampling, pneumatic testing was conducted on each soil vapor well to assess soil permeability at the target depths. To conduct the pneumatic tests soil vapor wells were connected to a Magnehelic gauge set, rotameter flowmeters, and a vacuum pump. The amount of vacuum developed when pumping at approximately 200 mL/min, 500 mL/min, 1 L/min, and 3 L/min were recorded on the field forms.

Following the pneumatic tests, the soil vapor wells were purged and sampled as detailed below:

- Soil vapor wells were attached with dedicated chrome plated ball valves (V1) and disposable Nylaflow® tubing to dedicated laboratory supplied and certified clean flow controllers, preset by the laboratory at a flow rate of 167 mL/min.
- The flow controllers were attached with disposable tubing running into a lung box to dedicated, new three liter Tedlar® bags using compression fittings.
- The lung box was connected to a vacuum pump through a 0-30 in. Hg vacuum gauge with Nylaflow® tubing.
- A plastic shroud was placed over the well head and filled with ultra high purity helium as a tracer gas. The helium concentration in the shroud was maintained at greater than 30% by volume throughout purging and sampling.
- To purge the wells, a vacuum pump was used to create a vacuum inside the lung box equal to approximately -20 in. Hg.

- A Tedlar® bag inside the lung box with the applied vacuum was allowed to fill until approximately one liter was collected. Valve V2 was then closed to prevent ambient air from entering the soil vapor well when the Tedlar® bag was removed from the lung box.



- The contents of the Tedlar® bags were screened in the field for CH_4, CO_2, and O_2 using a Landtech GEM 2000 Landfill Gas Detector; for helium using a Dielectric 7237 helium detector; and for total VOCs using a MiniRae 2000 Photoionization Detector (PID). Readings for CH_4, CO_2, O_2, He, and the PID were recorded on the field forms.
- Where possible, three separate approximately one liter volumes of soil vapor were purged from the soil vapor wells to document stable parameters prior to collecting soil vapor samples for laboratory analysis.
- For soil vapor wells that exhibited high vacuum conditions, if one liter of soil vapor could not be purged within one hour, no sample was collected.
- If the tracer gas was detected at a concentration greater than 1.5% by volume in the first liter purged, the fittings were retightened and another one liter purge volume was attempted. If the tracer gas was again detected at a concentration exceeding 1.5% by volume in a subsequent purge, no sample was collected.
- Following collection of three one liter purge volumes, a two liter volume of soil vapor was collected into a Tedlar® bag. The contents of the Tedlar®

bag were then screened with the Dielectric helium detector to assess potential leaks or breakthrough.

- If helium was detected at a concentration greater than 1.5% by volume, no sample was collected. If helium was not detected at concentrations greater than 1.5% by volume, the Tedlar® bag was attached using disposable Nylaflow® tubing and compression fittings to the dedicated laboratory supplied and certified clean flow controller, which was directly connected to the laboratory supplied and certified clean one liter summa canister. The summa canisters were then filled until only a residual vacuum (less than -5 inches Hg) remained in the canister.
- The Tedlar® bags were then removed from the flow controllers and the remaining soil vapor was screened for parameters (CH_4, CO_2, O_2, and total VOCs).
- Filled summa canisters were capped with brass compression caps and transported to under Chain of Custody procedures to Air Toxics for analysis of VOCs by EPA Method TO-15 and fixed gases by ASTM D-1945.
- One duplicate sample, one ambient air blank, and at least one trip blank were submitted to the laboratory along with the soil vapor samples at the end of each day of sampling.

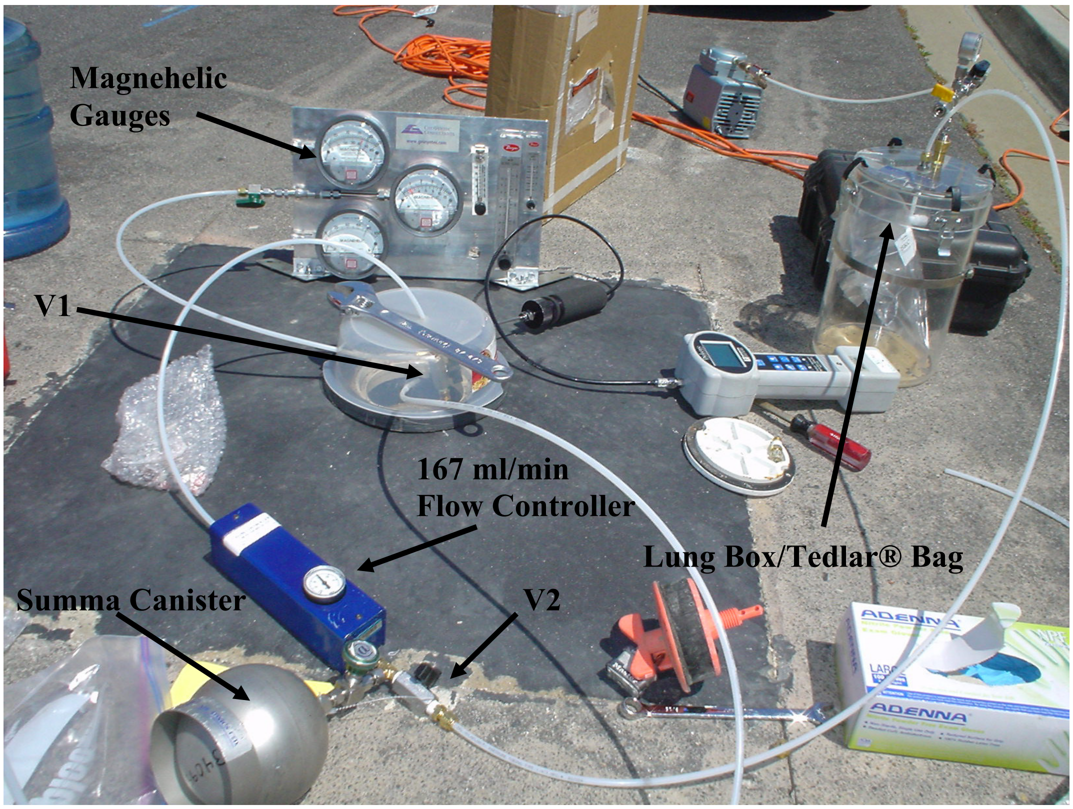
A5. May 2006 Sampling Event

Between 8 May and 1 June 2006 GeoSyntec personnel sampled onsite and offsite soil vapor wells with the exception of onsite soil vapor wells PVP-7 through -10. Following the April 2006 sampling event, it was determined that purging three liters prior to sampling the soil vapor wells may have led to surface breakthrough in some instances. Therefore, to reduce the chance of breakthrough during the May 2006 sampling event, the volume of soil vapor purged from the soil vapor wells was reduced from three liters to approximately three borehole volumes prior to sampling.

Purging was conducted in a similar manner as the April 2006 sampling event. However, during the May 2006 sampling event a sampling tee with a ball valve (V2 below) was attached between the flow controller and lung box to connect the summa canisters to the flow controllers. This eliminated the need to collect the sample into the Tedlar® bag and subsequently transfer the sample into the summa. In addition, a tee was also installed on top of V1 to connect the soil vapor well to the Magnehelic gauges to record the vacuum applied to the soil vapor wells during purging and sampling.

High flow soil vapor wells were purged and sampled during the May 2006 sampling event as follows:

- The soil vapor wells were attached to a Magnehelic gauge set, laboratory supplied and certified clean 167 ml/min flow controller, lung box/Tedlar® bag and laboratory supplied and certified clean summa canister as shown below.

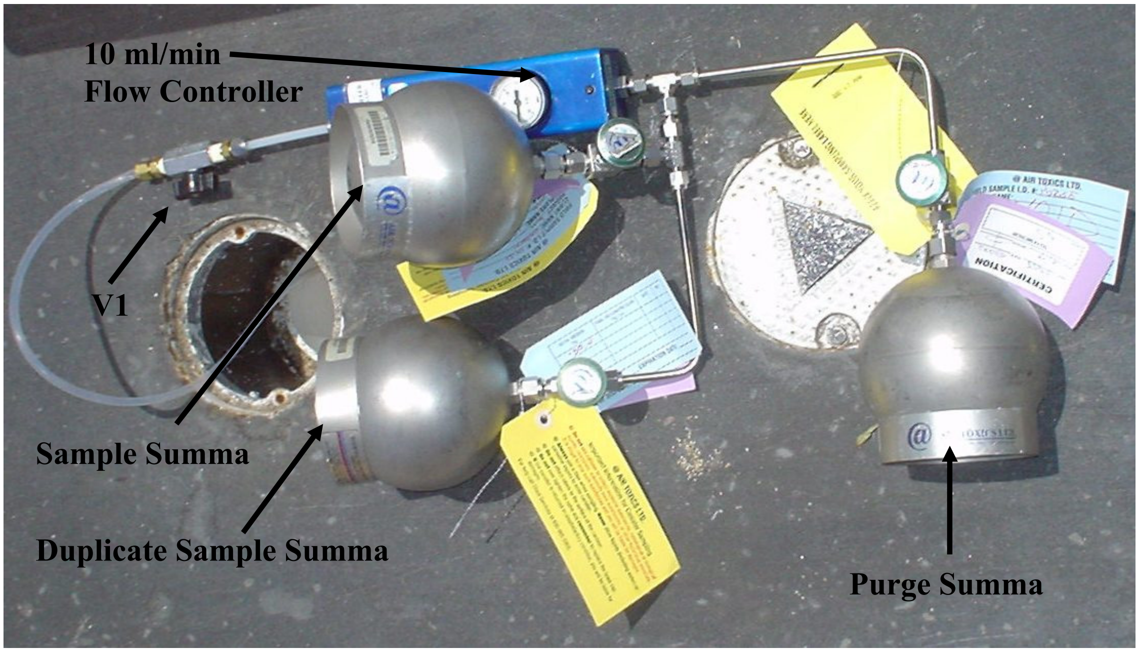


- With V2 closed, V1 was opened and the initial vacuum (if any) was recorded on the field logs.
- The lung box was evacuated to a vacuum of approximately -20 to -15 in. Hg and V2 opened to purge approximately three borehole volumes. The maximum well head vacuum developed during purging was recorded on the field logs.
- When approximately three borehole volumes had been collected in the Tedlar® bag, V2 was closed, and the vacuum in the lung box dissipated.
- The purged soil vapor in the Tedlar® bag was screened for helium using the Dielectric helium detector.
- If helium was detected at a concentration greater than 1.5% by volume in the purged volume, fittings were retightened and another three borehole volumes purged.

- If helium was not detected at a concentration greater than 1.5% by volume, the summa canister was opened to collect a sample directly from the vapor well. The summa canisters were filled until a residual vacuum (less than -5 in. Hg) remained. The maximum well head vacuum developed during sampling was recorded on field logs.
- Following collection of the soil vapor sample, V2 was opened and a small volume of soil vapor was again collected into the Tedlar® bag to screen for helium.
- If helium was not detected at a concentration greater than 1.5% by volume, the summa canister was removed from the sampling train and capped with a brass compression cap.

Soil vapor wells that exhibited high vacuum/low flow conditions during the April 2006 sampling event were purged and sampled as described below:

- Soil vapor wells were attached to laboratory supplied and certified clean flow controllers preset by the laboratory to 10 ml/min using disposable Nylaflow® tubing.
- Two laboratory supplied and cleaned summa canisters were attached to the flow controller using a duplicate sampling tee. One summa canister was used to purge the soil vapor well. The other summa canister was used to collect the soil vapor sample. In the below photo a duplicate sample summa was also attached. However, due to the low flow rates, a duplicate sample could not be collected from low flow soil vapor wells.



- The sample train was covered with a large plastic shroud.
- The soil vapor wells were purged for three hours or until approximately three borehole volumes had been purged. The purge summa canister was then closed.
- Isopropyl alcohol was used as a traced gas during the sampling of the low flow soil vapor wells. Paper towels soaked in isopropyl alcohol were triple bagged in Ziploc® freezer bags. The freezer bags were opened and placed under the shroud covering the sample train and well head. The sample summa was then opened and filled until a residual vacuum remained or until the remaining vacuum would no longer dissipate in the summa canister.
- Following collection of the soil vapor sample, the finial vacuum on the sample summa canister was recorded.

One duplicate sample, one ambient air blank, and at least one trip blank were submitted to Air Toxics under Chain of Custody procedures along with the soil vapor samples at the end of each day of sampling for analysis for VOCs by EPA Method TO-15 and fixed gases by ASTM D-1945. However, six low flow soil vapor wells were sampled on 11 May 2006, and due to the low flow conditions a duplicate sample could not be collected for this day.

A6. Soil Vapor Well Response to LFG Extraction System

A study was performed at the Poway Landfill between 10 April 2006 and 12 May 2006 to evaluate the response of soil vapor wells located at the southern site boundary, beneath waste and within waste to the LFG extraction system and barometric pressure changes. Soil vapor wells that were analyzed included:

- PVP-7A, PVP-8, PVP-9, and PVP-10A screened within the waste near the toe of the landfill;
- PVP-7B and PVP-10B screened in the soil below the waste; and
- PVP-1, PVP-1A, PVP-2A, PVP-2B, PVP-3A, PVP-3B, PVP-4A, PVP-4B, and PVP-5 screened in soil outside of the landfill waste footprint near the southern property boundary.

Results of the study were analyzed to qualitatively evaluate the influence of the LFG extraction system in the southern portion of the landfill and near the southern site boundary. A detailed discussion of the field testing methods and results is presented in Appendix G. Appendix G also includes figures that graphically present the testing results.

Field micromanometers (manometers) were utilized to measure and log the differential between the barometric (atmospheric) pressure and the absolute pressure in the medium in which each soil vapor well was screened. A separate instrument (barologger) was utilized to simultaneously measure and record barometric pressure and temperature. A total of fourteen tests were performed. The tests were typically performed for approximately 24-hour periods, usually starting after the LFG extraction system shut down each afternoon. The 24-hour monitoring period allowed evaluation of the pressure response in the soil vapor well for a full LFG extraction system operational cycle. The automated LFG extraction system typically started each day at approximately 0530 hours and shut down each day at a time between approximately 1425 and 1455 hours.

Manometers are utilized to display the difference between two absolute pressures. Each manometer has two ports that may be connected to soil vapor wells and vapor wells, fitting, and other media by tubing or left exposed to barometric pressure. For each soil vapor well and vapor well test location, one of the manometer ports was connected to the dedicated tubing (connected to the soil vapor well surface opening) while the other manometer port was allowed to equilibrate to the atmosphere. For this configuration, the manometer reading displayed the difference in the barometric pressure and the absolute pressure inside the medium in the vicinity of the soil vapor well screen.

Up to three soil vapor wells were simultaneously analyzed with separate manometers during each test. Each manometer was stored in the protective vault of the soil vapor well being analyzed for security purposes and to protect the instrument from weather. Also, for each test, the barologger was placed within one of the vaults containing a soil vapor well being analyzed. At the end of the test, the instruments were retrieved from the vaults and the data collected were downloaded to a laptop computer. If subsequent tests were to be performed, the instruments were "zeroed," connected to the next soil vapor well, and the next test was started.

The tests were performed in two stages. The first stage occurred from 10 through 21 April 2006. During this stage, all soil vapor wells were tested at least once. However, after this stage, some soil vapor wells were identified to be re-tested after evaluating the data. These wells were re-tested during the second stage, which occurred from 5 through 12 May 2006.

A7. Utility Line Survey

To assess underground utilities as a potential source of constituents detected in soil vapor samples collected south of the site, and to assess the migration of vapors through utility trench backfill in the area south of the site, GeoSyntec personnel installed and sampled four temporary soil vapor wells in the vicinities of utility lines south of the site in Dehia Street and El Mar Avenue on 16 May 2006. The temporary wells were installed using a 3 in. diameter hand auger at depths ranging from four to nine feet bgs. The temporary soil vapor wells were constructed within the backfill overlying the underground utility lines using ¼ in. OD HDPE tubing. The bottom six inches of the tubing was perforated and placed at the bottom of the borings. The borings were then backfilled with approximately one foot of Lapis Luster #2/12 sand filter pack, followed by 6 inches (Sewer Line #1) to two feet (Sewer Line #2, #3 and #4) of dry bentonite granules. Sewer Line #1 was constructed with six inches of dry bentonite granules to facilitate a three foot hydrated bentonite seal in the top of the borehole. Bentonite granules were hydrated in three inch lifts from the top of the dry granular bentonite to approximately three inches bgs. The temporary soil vapor wells were allowed to equilibrate for at least four hours prior to purging and sampling. The temporary soil vapor wells were purged and sampled in the same manner as the high flow soil vapor wells sampled during the May 2006 sampling event. One duplicate sample, one ambient air blank, and one trip blank were submitted to Air Toxics for analysis for VOCs by EPA Method TO-15 and fixed gases by ASTM D-1945 under chain of custody procedures. Following sample collection, tubing was removed from the boreholes and asphalt patch was used to repair the asphalt roadway where borings were advanced.

To further evaluate the potential of underground utilities as an alternate source of VOCs in the area south of the site, vapor samples were collected from the interior of four sanitary sewer vaults and three storm drain inlets within the residential area south of the site on 1 June 2006. Utility vapor samples were collected through laboratory supplied and certified clean 167 ml/min flow controllers into laboratory supplied and certified clean one liter summa canisters by lowering dedicated ¼ in. OD Nylaflow® tubing into the utility vaults through the manhole cover or inlet. One ambient air blank, one equipment blank, and one trip blank were submitted along with the vapor samples to Air Toxics for analysis of VOCs by EPA Method TO-15 and fixed gases by ASTM D-1945.

A8. Low Level Detection Groundwater Sampling

On 31 March and 3 and 4 April 2006 GeoSyntec personnel collected groundwater samples from downgradient groundwater monitor well POGW-16, abandoned Vapor Well 1, Vapor Well 2 and downgradient offsite groundwater monitor well POGW-15, -17A, -18A, and -18B. The lower level detection method was used to evaluate concentrations of VOCs below the standard laboratory method detection limit. Prior to purging, the depth to groundwater in monitor wells POGW-16, -15, -17A, -18A, and -18B, abandoned Vapor Well 1, and Vapor Well 2 near the southern property boundary were measured. The monitor wells were then purged using dedicated 2-inch diameter, stainless steel, Grundfos® submersible pumps until two borehole volumes of groundwater were removed. Following purging, the dedicated groundwater pumping systems were used for sample collection in monitor wells POGW-16, -15, -17A, -18A, and -18B. The abandoned vapor wells were purged and sampled using 2-inch disposable bailers.

Each monitor well was purged as described above until at least 1.5 boreholes of groundwater were removed (for fast recharging wells) or to dryness (for slow recharging wells). Field parameters (pH, specific conductance, turbidity, and temperature) were measured during purging. Purged groundwater was used for dust control at the landfill. Sample handling procedures are summarized below in Section A15.

A9. Surface Water Sampling

On 31 March, 6 April and 22 May 2006 surface water samples were collected at six locations. Surface water samples "Storm Water Pipe" and "SP1" were collected from the concrete channel on the northeastern side of the landfill near the origin of storm water discharging onto the site. Surface water samples Dehia St. #1, Sunset View #1, Los Olivios Ave. #1, Mirando St. #1, and Mirando St. #2 were collected from curb gutters within the public right-of-ways downgradient of the site.

Surface water samples, with the exception of the VOA vials, were collected by submerging the sample container in the flowing surface water and allowing the container to fill with water. VOA vials were filled by collecting a surface water sample in a disposable 1 liter poly bottle, which was then gently decanted into the VOA vials.

A10. Soil Sample Collection

Soil samples were collected using hand auger methods from three locations (DB-1, -2, -3) at depths of 0.5, 2.5 and 5 feet bgs within the desiltation basin located near the southern site boundary. Soil samples were also collected within Dehia and Mirando Streets and Sunset View Road from just beneath the asphalt, 2.5, and 5 feet bgs from borings VW-2A, -4, -5, and -12 using direct-push sampling methods.

A11. Drilling

Borings POGW-20 and -21 were advanced on 6 and 8 April 2006 using an all-terrain CME-75 hollow-stem auger drill rig capable of converting to rock coring drilling method. An eight-inch diameter auger was advanced through the residuum to the top of competent weathered granitic bedrock to prevent caving of no noncohesive soils and to improve circulation and cuttings return. After encountering competent bedrock at approximately 25 feet bgs, boring POGW-20 was advanced to a depth of 44 feet bgs using a 3.9-inch outside diameter rock-core drill bit. Boring POGW-21 was advanced using eight-inch diameter augers through residuum and extremely weathered granitic bedrock to a depth of 34 feet bgs. The two borings were logged by a GeoSyntec geologist working under the direction of a California Professional Geologist. Subsurface conditions encountered during drilling were described in the field and recorded on field boring logs. Drilling was conducted according to current SAM Manual guidelines (DEH, 2006). The boring logs for POGW-20 and POGW-21 are included in Appendix C.

A12. Groundwater Monitor Well Construction

At the conclusion of drilling, each boring was converted to a groundwater monitor well. Each monitor well consists of 2-inch schedule 40 PVC well casing with 15 feet of 0.020-inch factory slotted screen and a threaded well cap at the bottom. The annular space was backfilled with a filter pack consisting of #3 sand installed from 0.5 feet below the bottom of the screen to 2 feet above the top of the screen. A 4-foot bentonite seal was placed above the filter pack, hydrated with potable water, and allowed to stand for approximately 30 minutes. Above the bentonite seal, Volclay grout was tremmied to an approximate depth of 3 feet bgs. The annular space in the upper three feet of each boring was backfilled with concrete, and the surface was completed with a locking 12-inch diameter flush mount cover secured in a 3 foot by 3 foot concrete pad. Each monitor well was labeled with the well name on a metal tag. Drilling cuttings and fluids generated during drilling were placed in 55-gallon drums and transported to the top of the landfill. Following review of laboratory analytical data, drill cuttings were disposed of at Miramar landfill as non-hazardous waste (Appendix C).

A13. Groundwater Monitor Well Development

The groundwater monitor wells were developed by surging and bailing until the field parameters (pH, temperature, conductivity, and turbidity) stabilized to within 10 percent and at least 3 borehole volumes were removed. Purged groundwater was used at the landfill for dust control.

A14. Groundwater Monitor Wells POGW-20 and -21 Sample Collection

On 12 May 2006 prior to purging, the depth to groundwater in monitor wells POGW-20 and POGW-21 was measured. The monitor wells were then purged using dedicated 2-inch diameter, stainless steel, Grundfos® submersible pumps until three borehole volumes of groundwater were removed. Each pump system consists of a 2-inch-diameter, stainless steel, submersible Grundfos® pump connected to an electrical lead wire and discharge hose.

The monitor wells were purged as described above until approximately 3 boreholes of groundwater were removed. Field parameters (pH, specific conductance, turbidity, and temperature) were measured during purging. Purged groundwater was used for dust control at the landfill.

A15. Groundwater and Surface Water Sample Handling

The following subsections summarize the methods that were used for sample labeling, identification, containerizing, preservation, transportation, and maintaining proper chain of custody.

A15.1. Sample Containers and Preservation

Surface water and groundwater samples were collected in laboratory-prepared containers for analyses as follows:

ANALYSIS	PRESERVATIVE	SAMPLE BOTTLES
VOCs	HCl and Ice	(1) 40 ml VOAs (Surface Water) (3) 40 ml VOAs (Groundwater)
Low-Level VOCs	HCl and Ice	(3) 40 ml VOAs[1]
COD	H_2SO_4 and Ice	(1) 250 ml glass
Chloride, TDS, Nitrate, Sulfate, Carbonate and Bicarbonate	Ice	(1) 1 liter poly (POGW-20, -21) (2) 500 ml poly (POW-SP1)
Calcium, magnesium, potassium, and sodium		(1) 1 liter poly (POGW-20, -21) (1) 500ml poly (POW-SP1)

TDS - Total dissolved solids
COD – Chemical oxygen demand
HCl – Hydrochloric acid
VOA – Volatile organic analysis
[1] – 2-40 ml VOAs collected for POGW-17B

A15.2 Sample Transportation

Sample bottles were labeled, capped, sealed in plastic bags, stored on ice, and transported in an insulated cooler to the laboratory. The individual who collected the samples prepared them for shipment, completed the chain-of-custody form, and signed the form when transferring the samples to the laboratory courier.

A15.3 Chain of Custody Procedures

A chain-of-custody form was used to record possession of the samples from the time of collection to arrival at the laboratory. The samples were released to the laboratory by signature to the chain-of custody form. The laboratory control officer verified samples listed on the chain-of custody form were present; verified sample integrity; and that proper sample preservation procedures were utilized.

A15.4 Field Quality Assurance/Quality Control

QA/QC for field procedures refers to methods to check the quality of the field techniques. Field instruments were calibrated in accordance with the manufacturer's instructions at the beginning of each field day.

In addition to the primary groundwater samples, the following QA/QC samples were collected:

- **Field Blank**. A field blank, consisting of distilled water transferred from its original container to a sample container in the field was collected to evaluate the potential for airborne VOCs to impact the groundwater samples during sample collection. Field blanks were collected during groundwater sampling activities in March through May 2006 and analyzed for the same VOCs as the groundwater samples.

- **Trip Blank**. Trip blanks, provided by the laboratory, were used to evaluate whether VOC contamination occurred during sample transport or storage. A trip blank consists of a deionized water sample prepared at the analytical laboratory and transported to the field by sampling personnel, shipped along with the groundwater samples to the laboratory, and analyzed for the same VOCs as the groundwater samples. Trip blanks accompanied each shipment (cooler) of groundwater samples.

A16. Analytical Methods

Analytical methods requested for the groundwater samples were listed on each chain-of-custody form. Laboratory analyses were performed at Calscience Environmental Laboratories located in Garden Grove, California. This laboratory is certified under the California Department of Health Services Laboratory Program. The following sections briefly describe the analytical methods employed by the laboratory.

A16.1 Volatile Organic Compounds

Groundwater and soil samples were analyzed for VOCs using EPA Method 8260B. Groundwater and surface water samples for low level detection monitoring were analyzed for VOCs using EPA Method 8260B with a 20 ml purge volume. These methods use gas chromatography to separate and identify the sample constituents by mass spectrometry. Detection limits are reported on the certificates of analysis (Appendix F) as both the reporting limit (RL) and the method detection limit (MDL). The laboratory RL is the lowest concentration at which a detected compound can be quantified to within 10 percent of the constituents actual concentration (99% certainty). The MDL is the lowest concentration at which a compound can be detected (99% certainty). A "J" qualifier on the certificates of analysis and the analytical tables indicates compounds detected at "trace" concentrations between the MDL and the RL. Trace concentrations are too low for accurate quantification and are estimated by the laboratory.

A16.2 Dissolved Metals

Upon receipt at the laboratory, the groundwater samples for dissolved metals analysis were filtered and preserved. Dissolved metals were analyzed by EPA Method 6010B.

A16.3 General Chemistry Parameters

Specific conductance, pH, temperature, and turbidity were measured in the field. TDS was analyzed by EPA Method 160.1. Chemical oxygen demand was analyzed using EPA Method 410.4.

A16.4 Anions

Carbonate and bicarbonate were analyzed using EPA Method 310.1. Sulfate and nitrate as nitrogen were analyzed using EPA Methods 375.4 and 353.3, respectively. Chloride was analyzed using standard method SM 4500-CL-B.

A17. Soil Vapor and Groundwater Monitor Well Surveying

The groundwater monitor wells and soil vapor wells were surveyed both vertically and horizontally by a licensed surveyor in the State of California.

Well ID	TOC Elevation	Northing	Easting
POGW-20	620.00	32.9635302	-117.0170797
POGW-21	617.92	32.9635259	-117.0182689
PVP-1A	622.00	32.9639760	-117.0174509
PVP-2A/2B	613.46	32.96352987	-117.0180111
PVP-3A/3B	621.31	32.96353364	-117.0170387
PVP-4A	613.85	32.9635386	-117.0174640
PVP-4B	613.85	32.9635394	-117.0174600
PVP-5	638.76	32.96 38673	-117.0164167
PVP-6	708.05	32.9658290	-117.0203530
PVP-7A	644.83	32.9638280	-117.0184779
PVP-7B	644.80	32.96382894	-117.0184723

Well ID	TOC Elevation	Northing	Easting
PVP-8	642.73	32.9638607	-117.0181626
PVP-9	642.10	32.9639170	-117.0177874
PVP-10A	643.12	32.96397577	-117.0174568
PVP-10B	643.15	32.9639760	-117.0174509
VW-1A	620.83	32.96316948	-117.0163131
VW-1B	620.87	32.96317005	-117.0163083
VW-2A	615.00	32.9631788	-117.0168314
VW-2B	615.07	32.9631796	-117.0168271
VW-3A	605.86	32.9631810	-117.0173845
VW-3B	605.90	32.9631809	-117.0173795
VW-4A	604.69	32.96317266	-117.0179396
VW-4B	604.71	32.9631729	-117.0179351
VW-5A	606.09	32.96317249	-117.0183504
VW-5B	606.10	32.9631727	-117.0183458
VW-6A	603.44	32.96267058	-117.0185309
VW-6B	603.44	32.9626744	-117.0185310
VW-7A	599.86	32.96225387	-117.0185298
VW-7B	599.82	32.96224942	-117.0185301
VW-8A	596.61	32.9623918	-117.0176912
VW-8B	596.67	32.96239586	-117.0176906
VW-9	601.13	32.9624302	-117.0167619
VW-10	619.23	32.96251729	-117.0157392
VW-11	598.18	32.96043409	-117.0150473
VW-12	576.97	32.96056916	-117.0179940
VW-13	583.41	32.96065638	-117.0194415
VW-14	612.11	32.96212908	-117.0196561

TOC Elevation – Top of casing elevation above mean sea level